

Operating Manual



INSYS WLAN bridge WLAN serial

Version 1.01 / 10.04

INSYS
MICROELECTRONICS

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1st edition, version 1.01 / 10.04

0	IMPORTANT SAFETY INSTRUCTIONS.....	1
1	SCOPE OF DELIVERY.....	1
2	GENERAL INFORMATION ABOUT WIRELESS LAN	2
2.1	INSYS WLAN SERIAL AND INSYS WLAN BRIDGE.....	2
2.1.1	INSYS WLAN serial	2
2.1.2	INSYS WLAN bridge.....	2
2.2	INFRASTRUCTURE OR ADHOC MODE.....	2
2.2.1	Infrastructure Mode.....	3
2.2.2	Adhoc Mode	3
2.3	VIRTUAL COM PORT.....	3
3	TECHNICAL DATA.....	4
3.1	GENERAL.....	4
3.1.1	Features.....	4
3.1.2	Mechanical Features	4
3.2	FRONT ELEMENTS.....	5
3.3	TERMINAL LAYOUT.....	6
3.4	POWER SUPPLY	7
3.5	INTERFACES.....	7
3.5.1	Serial Interface.....	7
3.5.2	Ethernet, 10 Base-T.....	8
3.5.3	Antenna Connection	9
3.5.4	Digital Inputs And Galvanic Insulated Outputs	9
3.6	TRANSMISSION STANDARDS / PROTOCOLS.....	10
3.7	APPROVALS	10

3.8	FIRMWARE.....	10
4	INSTALLATION	11
4.1	SAFETY INSTRUCTIONS DURING INSTALLATION	11
4.2	CONNECTION OVERVIEW.....	11
4.3	INSTALLATION STEPS	12
5	IMPLEMENTATION AND CONFIGURATION INSYS WLAN BRIDGE	13
5.1	WLAN NETWORK STRUCTURE.....	13
5.2	ADDRESSING WITHIN THE IP NETWORK	13
5.3	RESET FUNCTION	13
5.4	CONFIGURATION THROUGH BROWSER	14
5.4.1	Operation	14
5.4.2	Configuration.....	14
5.4.3	Configuration Page Status.....	15
5.4.4	Wireless Settings	16
5.4.5	IP Settings	17
5.4.6	Bridge Table	18
5.4.7	Administration.....	19
5.4.8	Bridging Function “Layer 2.5 NAT”	19
5.5	FIRMWARE UPDATE.....	20
6	IMPLEMENTATION AND CONFIGURATION INSYS WLAN SERIAL.....	21
6.1	CONFIGURATION SOFTWARE HSCOMM	21
6.1.1	General Operation	21
6.1.2	Basic Settings	24
6.1.3	Network	26

6.2	CONFIGURATION VIA TERMINAL PROGRAM	30
6.2.1	AT Commands for Default Settings	30
6.2.2	Serial Interface	30
6.2.3	WLAN Network Structure	31
6.3	REMOTE CONFIGURATION VIA TELNET	31
6.4	FIRMWARE UPDATE.....	33
7	COMMAND OVERVIEW INSYS WLAN SERIAL	34
7.1	AT COMMANDS.....	34
7.1.1	Syntax of Standard AT Commands.....	34
7.1.2	Overview AT Commands	34
7.2	RESPONSES AND NUMERICAL CODES	44

0 Important Safety Instructions

The BSI (German Federal Office for IT Safety) has drawn up an information brochure “Wireless LAN Safety” (Sicherheit im Funk-LAN), which clearly describes the set-up as well as safety aspects of the WLAN according to IEEE 802.11b.
<http://www.bsi.de/literat/doc/wlan/wlan.pdf>

Attention! Before implementing the system, please inform yourself about the currently effective safety regulations.

1 Scope Of Delivery

Before you begin with the installation and the initial operation, please check if all accessories are included in the box.

- INSYS WLAN serial or INSYS WLAN bridge
- RS232- cable, 9-pin (only for WLAN serial)
- Network cable (only for WLAN bridge)
- Operating Manual

The following accessories are optionally available:

- Main antenna with reverse SMA connection
- Auxiliary antenna with reverse SMA connection

In case the content is not complete, please refer to your supplier. Please also check the device for shipping damage; please refer to your supplier if damage exists.

Please keep the packaging material for possible future dispatch or storage.

2 General Information About Wireless LAN

2.1 INSYS WLAN serial and INSYS WLAN bridge

The INSYS WLAN serial and INSYS WLAN bridge are communication devices for industrial applications. They are designated for the use on the DIN rail in the switchboard. In the Wireless LAN, the transmission of data takes place with up to 11 Mbit/s, according to the industrial standard IEEE 802.11 b.

WLAN connections may be established to AccessPoints (infrastructure mode) as well as in adhoc networks. The radio connection is made with a main antenna and optionally with an auxiliary antenna for improved reception (diversity). The antenna connections are reverse SMA plugs. The radio connection is protected by Wireless Equivalent Privacy (WEP) with 64 or 128 bit keys.

2.1.1 INSYS WLAN serial

The INSYS WLAN serial transmits the serial data in IP packets, the standard for local networks and the Internet. At the remote terminal, control software receives the data directly or via a virtual COM port. The configuration takes place via the configuration software HSComm, AT commands or Telnet. The serial interface works with up to 115 kbps.

Both devices have 2 digital inputs and 2 galvanic insulated outputs, which may be used for additional tasks.

2.1.2 INSYS WLAN bridge

The INSYS WLAN bridge is an Ethernet WLAN bridge, which integrates Ethernet devices, or connects two network segments with each other, by a radiolink.

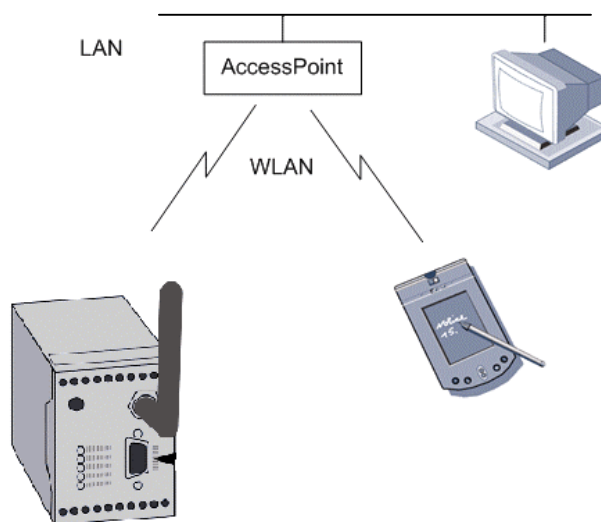
The configuration takes place via a web interface (Ethernet or WLAN); the Ethernet access is designed as 10 Base-T. The IP address can be allocated directly or via DHCP.

2.2 Infrastructure or Adhoc Mode

The wireless network according to the standard WLAN IEEE 802.11b enables the operation in two different modes:

2.2.1 Infrastructure Mode

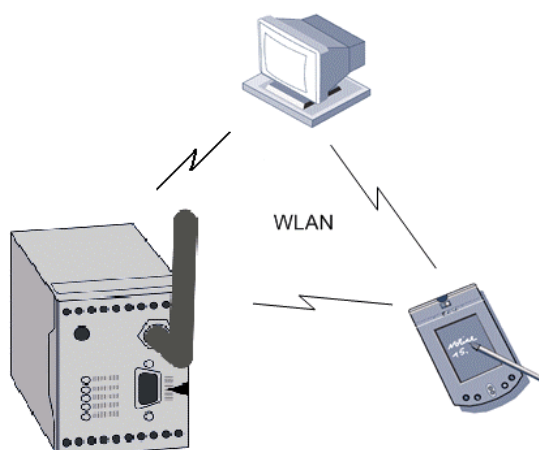
All WLAN devices connect to an AccessPoint which routes data between the connected devices and to a wire-bound LAN. Several AccessPoints can establish a joint WLAN (with the same SSID code) and also allow transparent handover. The infrastructure mode is the standard operating mode.



2.2.2 Adhoc Mode

WLAN devices can also merge without a dedicated master and form an adhoc network (peer-to-peer communication). The first active device will assume the master role.

The adhoc mode is a part of the WLAN standard, but is not completely supported by all WLAN devices.



2.3 Virtual COM Port

When an application under Microsoft Windows requires a serial interface, which is not available physically, a virtual COM port driver is needed. The virtual COM port driver transforms the data intended for the serial interface into IP data, which are then transmitted via a network.

INSYS MICROELECTRONICS provides a free virtual COM port driver.

3 Technical Data

3.1 General

3.1.1 Features

- Mounting on DIN rail
- Power Supply 10...60 V DC, 5% ripple
- Wireless LAN Standard IEEE 802.11b
- Radio frequency 2.4 GHz
- Transmission rate up to 11 Mbit/s
- Encryption 64 Bit or 128 Bit WEP
- Level on V.24 interface according to V.28 (only INSYS WLAN serial)
- Protected V.24/V.28 interface with 9-pin SUB-D jack (only INSYS WLAN serial)
- Ethernet connection, 10 Base-T (only INSYS WLAN bridge)
- 2 digital inputs
- 2 galvanic insulated outputs (only INSYS WLAN serial)

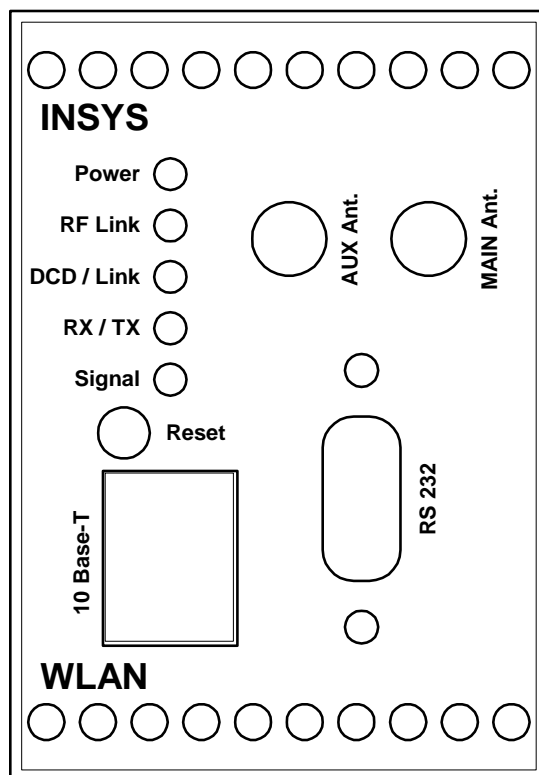
3.1.2 Mechanical Features

Weight	250g
Dimensions (maximum)	w x d x h = 55mm x 120mm x 75mm
Temperature range	-20°C...+55°C
Protection class	Housing IP 40/ Terminal IP 20
Humidity	0 - 95% non-condensing

Attention! The INSYS WLAN serial and the INSYS WLAN bridge must not be used in wet environments!

3.2 Front Elements

Front view



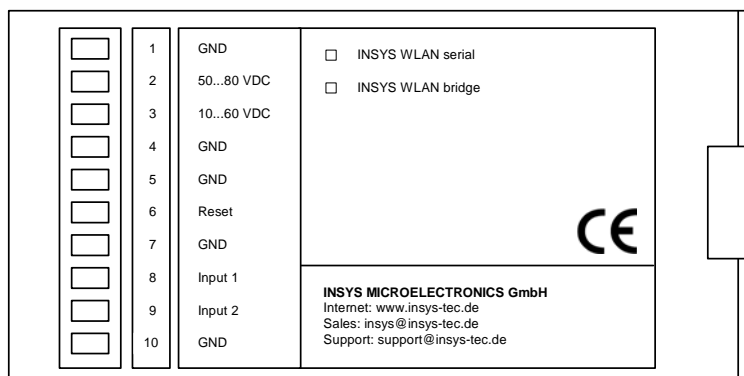
The INSYS WLAN devices are equipped with important display elements. Besides the “Power LED”, the LEDs “RF Link”, “DCD/Link” and “RX/TX” indicate the most important operating states.

LED on	WLAN serial	WLAN bridge
Power	The device is supplied with operating voltage and is ready for operation	The device is supplied with operating voltage and is ready for operation
RF Link	A WLAN connection has been established	A WLAN connection has been established
DCD/Link	A connection via the serial interface is active	A connection to a network (link) is active
RX/Tx	Data is transmitted	Data is transmitted
Signal	Currently no function	Currently no function

3.3 Terminal Layout

The terminals are designed as screw terminals and are located on the top and bottom of the cover.

View of the cover top

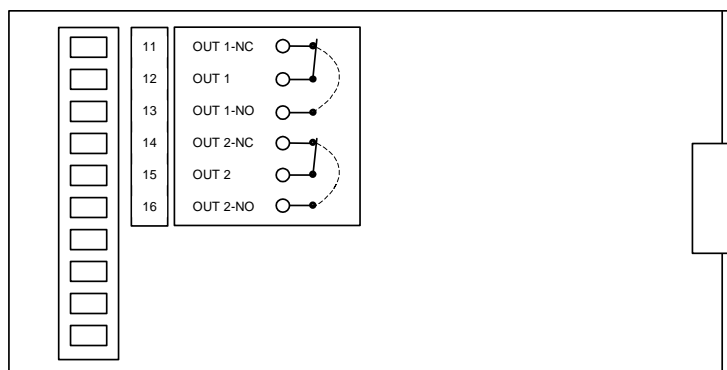


Layout of the terminals on the cover top

Terminal	Labeling	Description
1	GND	Ground
2	50...80 VDC	Supply voltage input 50 – 80 V DC (optional)
3	10...60 VDC	Supply voltage input 10 – 60 V DC
4	GND	Ground
5	GND	Ground
6	Reset	Reset input
7	GND	Ground
8	Input 1	Digital input 1
9	Input 2	Digital input 2
10	GND	Ground

Attention! For series devices, the supply voltage input for the range 50 – 80 V DC at terminal 2 is not equipped. If required, devices with this supply voltage input may be ordered.

View of the cover bottom



Layout of the terminals on the cover bottom

Terminal	Labeling	Description
11	OUT 1-NC	Output 1 – normally closed contact
12	OUT 1	Output 1, COM
13	OUT 1-NO	Output 1 – normally open contact
14	OUT 2-NC	Output 2 – normally closed contact
15	OUT 2	Output 2, COM
16	OUT 2_NO	Output 2 – normally open contact

3.4 Power Supply

Power supply: 10...60 V DC, 5% ripple
In addition, a second power supply range 50...80 V DC is possible. This, however, must be ordered separately, if required.

Power input: Approx. 3 W (during connection)

Current consumption:

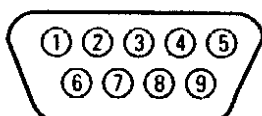
Current consumption at 10VDC approximately	280mA
Current consumption at 24VDC approximately	120mA
Current consumption at 36VDC approximately	80mA

3.5 Interfaces

3.5.1 Serial Interface

Attention! This interface is only active for the INSYS WLAN serial.

View of the 9-pin D-SUB jack



Description of the signals on the 9-pin D-SUB connector

Pin	Description	Function	CCITT V-24	EIA RS232	DIN 66020	E/A DCE to DTE
1	DCD	Data Carrier Detect	109	CF	M5	O
2	RXD	Receive Data	104	BB	D2	O
3	TXD	Transmit Data	103	BA	D1	I
4	DTR	Data Terminal Ready	108	CD	S1	I
5	GND	Ground	102	AB	E2	
6	DSR	Data set ready	107	CC	M1	O
7	RTS	Request to send	105	CA	S2	I
8	CTS	Clear to send	106	CB	M2	O
9	RI	Ring Indication	125	CE	M3	O

Supported interface speeds of the RS232 for the INSYS WLAN serial:

300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps.

The baud rate indicates the transmitted bits per second (bps).

Supported data formats:

(Number of data bits, parity, number of stop bits) 8N1, 8E1, 8O1, 8N2, 7E1, 7O1, 7N2, 7E2, 7O2

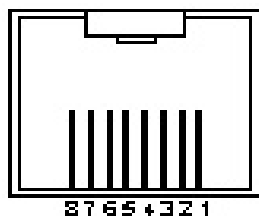
Handshake:

Hardware handshake via the signal lines RTS/CTS or no handshake

3.5.2 Ethernet, 10 Base-T

Attention! This interface is only active for the INSYS WLAN bridge.

View of the RJ45 jack



Description of the RJ45 jack signals

Signal	Connection to RJ45
Rx-	6
Rx+	3
Tx-	2
Tx+	1

3.5.3 Antenna Connection

The connection of the antennas takes place via two built-in reverse SMA plugs.

The main antenna is connected to the right connector (Main Ant.) and at the left connector (AUX Ant.) an auxiliary antenna can be connected in addition.

The main antenna is used to transmit and receive; the auxiliary antenna is only used to receive. The module independently selects the antenna with the better reception.

Note: The connection of an auxiliary antenna is not mandatory. The auxiliary antenna, however, may enhance the reception (diversity) and thus increase the transmission rate.

Frequency: 2.4 GHz (ISM frequency band) – ETSI channel utilization

Transmitting power: Typ 15dBm (30mW)

Sensitivity (BER<10⁻⁵): Typ -84 dBm at 11MBit/s, -87 dBm at 5.5 MBit/s, -90 dBm at 2 MBit/s, -93 dBm at 1 MBit/s

3.5.4 Digital Inputs And Galvanic Insulated Outputs

3.5.4.1 Digital Inputs (Only INSYS WLAN serial)

The digital inputs are designed as pull-up and are on HIGH in inactive, open state. The inputs are set through the connections to the device ground (GND). It is furthermore possible to query the state of the inputs (**AT*I**) remote by. See also AT command set, Chap. 7.1.2.

Terminal	Labeling	Description
7	GND	Ground
8	Input 1	Digital input 1
9	Input 2	Digital input 2
10	GND	Ground

3.5.4.2 Galvanic Insulated Switch Outputs (Only INSYS WLAN serial)

The switch outputs are operated via AT command (**AT*Y**), which is also possible by remote. The switch outputs are galvanic insulated relay switches.

The maximum switch voltage may not exceed 30V DC or 42V AC.

The maximum current load is 1 A DC or 0.5 A AC.

Terminal	Labeling	Description
11	OUT 1-NC	Output 1 – normally closed contact
12	OUT 1	Output 1, COM
13	OUT 1-NO	Output 1 – normally open contact
14	OUT 2-NC	Output 2 – normally closed contact
15	OUT 2	Output 2, COM
16	OUT 2_NO	Output 2 – normally open contact

3.6 Transmission Standards / Protocols

- IEEE 802.11b
- ARP, ICMP, TCP/IP, UDP/IP (INSYS WLAN serial)
- ARP, IP, ICMP, TCP/IP, UDP/IP, http, DHCP (INSYS WLAN bridge)

3.7 Approvals

The INSYS WLAN serial and INSYS WLAN bridge both bear the CE symbol of conformity. This symbol is a declaration that on account of its design and implementation, this modem is in compliance with the currently valid versions of the following EC directives:

- 89/336/EEC (EMC directive)
- 73/23/EEC (Low voltage directive)

Approvals:

- CE

3.8 Firmware

INSYS WLAN serial:

Date: June 2004

Version: 1.10

INSYS WLAN bridge:

Date: March 2004

Version: 1.00

4 Installation

4.1 Safety Instructions During Installation

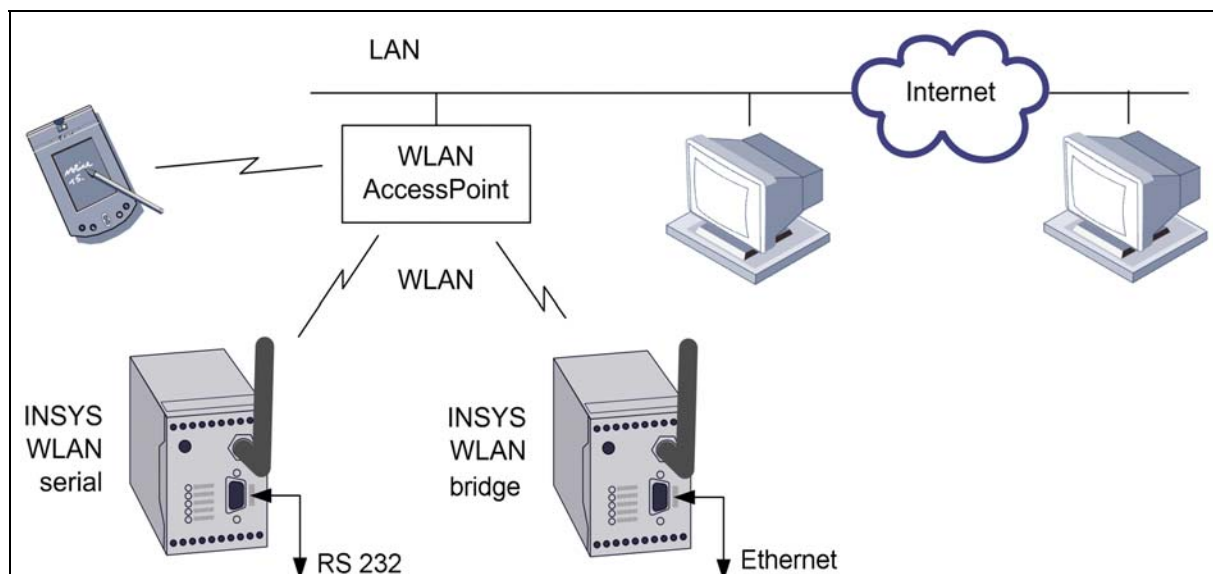
When repairing and installing electric systems and devices, the according VDE regulations must be observed.

The BSI (German Federal Office for IT Safety) has drawn up an information brochure "Wireless LAN Safety" (Sicherheit im Funk-LAN), which clearly describes the set-up as well as safety aspects of the WLAN according to IEEE 802.11b.

<http://www.bsi.de/literat/doc/wlan/wlan.pdf>

Attention! Before implementing the system, please inform yourself about the currently effective safety regulations.

4.2 Connection Overview



4.3 Installation Steps

1. Mounting on DIN rail:

Simple snap-on

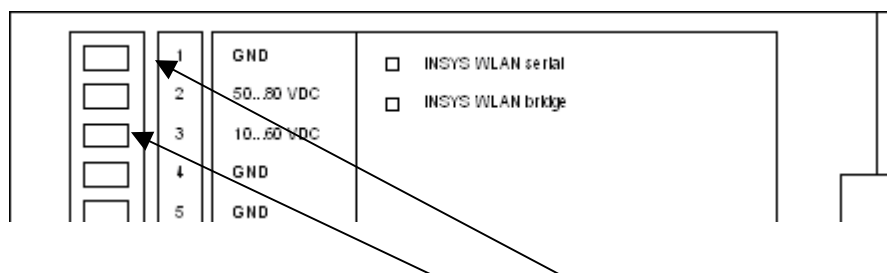
2. Attaching the antenna(s)

Simple screw-on; please do not bend the antenna.

3. Connecting the RS232 or the Ethernet connection

Plug the enclosed RS232 interface cable (INSYS WLAN serial) or the network cable (INSYS WLAN bridge) into the cover front and connect it with the PC.

4. Connecting the Power Supply:



a) Connecting the ground wire GND (terminal 1)

b) Connecting the power supply 10...60 V DC (terminal 3)

Attention! For mass production devices, the supply voltage input 50...80 V DC at terminal 2 is optional and not equipped.

c) Switching on the power supply

After successful installation, the power LED will be green.

Attention! When the device acts faulty or abnormal, please disconnect the power supply immediately. For those cases, please refer to your supplier. To protect your guarantee claims, please **do not intervene** with the device.

The further implementation or configuration of the INSYS WLAN bridge is described in Chap. 5; INSYS WLAN serial is described in Chap. 6.

5 Implementation And Configuration INSYS WLAN bridge

5.1 WLAN Network Structure

For a network structure according to IEEE 802.11b, the included devices must be coordinated regarding the following settings:

Description	Website (see Chap. 6.3)
Radio channel (only for adhoc network)	Wireless settings (Chap. 5.4.4)
Clear text name of the radio network (SSID)	
Architecture: Infrastructure or adhoc	
WEP Encryption	
Gateway for the local network segment	IP Settings (Chap.5.4.5)
Network mask for the local network segment	
Own IP address	

5.2 Addressing Within the IP Network

Devices in IP networks – office or Internet networks – use 3 details to identify the own device, the own network segment, and the gateway for connections to other subnetworks.

All IP addresses consist of a sequence of 4 numbers in a range of values from 0 to 255, e.g. 192.168.100.45. For private networks without direct Internet connection, numbering areas such as 192.168.*.* are reserved. The IP address describes the network segment as well as the number of the individual device within this segment.

IP address: Own address of the INSYS WLAN bridge
e.g. 192.168.100.203

Subnetwork mask: Part of the address which describes the network segment:
The subnetwork 255.255.255.0, for example, marks the first three numbers 192.168.100 of the address 192.168.100.203 as network segment.

Standard gateway: All data packets to recipients outside the own network segment are transmitted to the gateway to be forwarded.

5.3 Reset Function

Press the reset key on the cover front to restart the INSYS WLAN bridge. Last saved settings remain established.

If, however, the reset key is briefly pressed five times in succession, a complete device reset will take place and the INSYS WLAN bridge is reset to default factory settings. This will enable the device to be reset to default factory settings without having to establish a connection to the device. This function is very useful when the INSYS WLAN bridge can not be returned to an operational state, due to an accidental false entry during configuration or when a password is lost.

5.4 Configuration Through Browser

5.4.1 Operation

The configuration pages allow simple and convenient configuration of the INSYS WLAN bridge using a web browser (e.g. Internet Explorer, Netscape, Opera), regardless of the used operating system. No drivers, etc. are required for the configuration.

The web interface is protected by a password. During the factory configuration, the fields user name and password are empty, i.e. the pages can be accessed without entering a password.

Note: A lost password can only be reset by completely resetting the factory configuration. See RESET key to reset the INSYS WLAN to the default factory settings (Chap. 5.3).

The settings in the individual configuration windows will only be saved when the button “Apply” is clicked. To ensure that the settings are applied, a reboot of the INSYS WLAN bridge must be performed. This is also possible from the configuration pages.

After the settings have been transmitted to the INSYS WLAN bridge, the configuration pages must be reloaded (menu “Update” of the web browser).

The configuration pages are available in two languages. Use the symbol for the English or German flag in the top right corner to switch between the two languages.



5.4.2 Configuration

To be able to configure the INSYS WLAN bridge, it must have a network connection to a computer with a web browser, either via the AccessPoint or the LAN connection (Ethernet). The standard settings for the network parameters after delivery or resetting to the factory settings are as follows:

IP = 192.168.100.203

Network mask = 255.255.255.0

Gateway = 192.168.100.1

For the initial installation a PC is required which can access this network segment, i.e. which has an IP address from this network segment.


The easiest way is to set the PC to an address from this network segment (e.g. 192.168.100.100). Depending on the system, administrator rights may be required. The connection between an INSYS WLAN bridge and the configuration PC takes place with a crossed network cable. After the IP settings have been configured to the desired values,

the PC can be reset to the previous IP address. The PC and the INSYS WLAN bridge can then be reconnected normally with the network.

Note: At all events, avoid the LAN connection of the AccessPoints and the LAN connection of the INSYS WLAN bridge being connected to the same network. This will lead to bridging of the packets into the same network and to serious malfunctions in the network and subsequently also to serious problems with your system administrator.

If the IP address has accidentally been adjusted and/or is not known, the INSYS WLAN bridge can also be reset to the factory settings without the web interface, using the RESET key. See Chap. 5.3.

5.4.3 Configuration Page Status

INSYS MICROELECTRONICS		WLAN 802.11b to Ethernet Bridge 				
Status	Wireless settings	IP settings	Bridge Table	Admin settings	FW-Update	
Information about the bridge. NOTE: Reload this page to see the current settings.						
Connected to SSID: WLANDEMO Using channel: 6 MAC address of AP: 0200D587677E Data rate (Mbits/s): 11 Signal quality (%): 0 Own MAC address: 0005B60004F9 Current IP address: 192.168.100.203 Bridge Firmware version: 1.0						
V1.00 (C) 2004 INSYS Microelectronics GmbH http://www.insys-tec.de						

The status page displays the current state of the INSYS WLAN bridge .

In detail, the following information is provided:

Connected to SSID: SSID of the remote terminal (AccessPoint or another bridge in adhoc mode), to which the module has a connection

HF channel: Currently used channel

MAC address of the AP: MAC address of the remote terminal (adhoc) or of the AccessPoint

Data rate (Mbits/s): Currently reached data rate


Signal power (%): Current quality of the received signal level – the signal should be more than 20%

Own MAC address: MAC address of the INSYS WLAN bridge

IP address: Set (static mode) or allocated (DHCP mode) IP address of the INSYS WLAN bridge

Firmware version: Firmware version number

5.4.4 Wireless Settings


INSYS MICROELECTRONICS		WLAN 802.11b to Ethernet Bridge 				
Status	Wireless settings	IP settings	Bridge Table	Admin settings	FW-Update	
<p>Wireless Settings</p> <p>This page is used to set the 802.11b wireless parameters. Parameter changes will require a reboot..</p>						
Operating Mode:		<input checked="" type="radio"/> Ad-Hoc <input type="radio"/> Infrastructure				
SSID:		<input type="text" value="WLANDEMO"/> (blank field means any SSID)				
Channel:		<input type="text" value="6 (default)"/> (channel used by Ad-Hoc mode)				
Transmission rate:		<input type="text" value="Auto Fallback (default)"/>				
Access Point Density:		<input type="text" value="Small Distance (default)"/> (used only for Infrastructure mode)				
WEP enabled:		<input type="checkbox"/>				
WEP Key Length:		<input type="text" value="128 bit (default)"/>				
		<p>64 bit keys require 10 hex digits in the key fields 128 bit keys require 26 hex digits in the key fields Enter hex digits (0..9, A..F) without spacing A blank key field means "no key"</p>				
WEP key 1:		<input type="text"/>				
WEP key 2:		<input type="text"/>				
WEP key 3:		<input type="text"/>				
WEP key 4:		<input type="text"/>				
WEP key to be used:		<input type="text" value="Key 1 (default)"/>				
						<input type="button" value="Save"/> <input type="button" value="Cancel"/>
V1.00 (C) 2004 INSYS Microelectronics GmbH http://www.insys-tec.de						

On this page, the parameters for the WLAN interface are set:

Station mode: Determination of the WLAN architecture (see Chap. 2.2)
 “adhoc” (peer-to-peer) or “infrastructure”

- SSID:** Enter the WLAN network SSID (default "WLANDEMO"). An empty input field indicates a connection with any available network.
- Channel:** Radio channel when using the adhoc mode. In adhoc mode, all involved stations must be set to the same channel. This channel may not be used by other WLAN networks in the reception area at the same time (default "6"). In infrastructure mode the channel is assigned by the AccessPoint.
- Transfer rate:** Fixed data rate directly in Mbit/s or fallback behavior ("default "Auto Fallback").
- AccessPoint density:** This setting influences the search behavior for AccessPoints depending on their quantity within the environment. In general, there is no need to adjust this setting – only when many AccessPoints are present and problems occur when registering to the correct AccessPoint (default "Small Distance").
- WEP Encryption:** When this button is activated, the WEP encryption as well as the Shared Key Authentication are switched on (default "Deactivated").
- WEP length of key field:** Length of the WEP key field for encryption. The following lengths are allowed: 64 bit and 128 bit
- WEP key:** Enter a maximum of 4 WEP keys:
For 64 bit encryption each WEP key consists of 10 hexadecimal digits (5 bytes); for 128 bit encryption each WEP key consists of 26 hexadecimal digits (13 bytes). The hexadecimal digits (,0'..'9', ,A'..'F') are entered without spaces.
- Key to be used:** Selects the key to be used from the 4 defined WEP keys.

5.4.5 IP Settings

INSYS MICROELECTRONICS		WLAN 802.11b to Ethernet Bridge 				
Status	Wireless settings	IP settings	Bridge Table	Admin settings	FW-Update	
IP settings		This page is used to set IP parameters. Parameter changes will require a reboot..				
		IP Address Mode: <input checked="" type="radio"/> Static <input type="radio"/> DHCP				
		IP address: <input type="text" value="192.168.100.203"/>				
		Subnet mask: <input type="text" value="255.255.255.0"/>				
		Default gateway: <input type="text" value="192.168.100.1"/>				
		<input type="button" value="Save"/> <input type="button" value="Cancel"/>				
V1.00 (C) 2004 INSYS Microelectronics GmbH http://www.insys-tec.de						

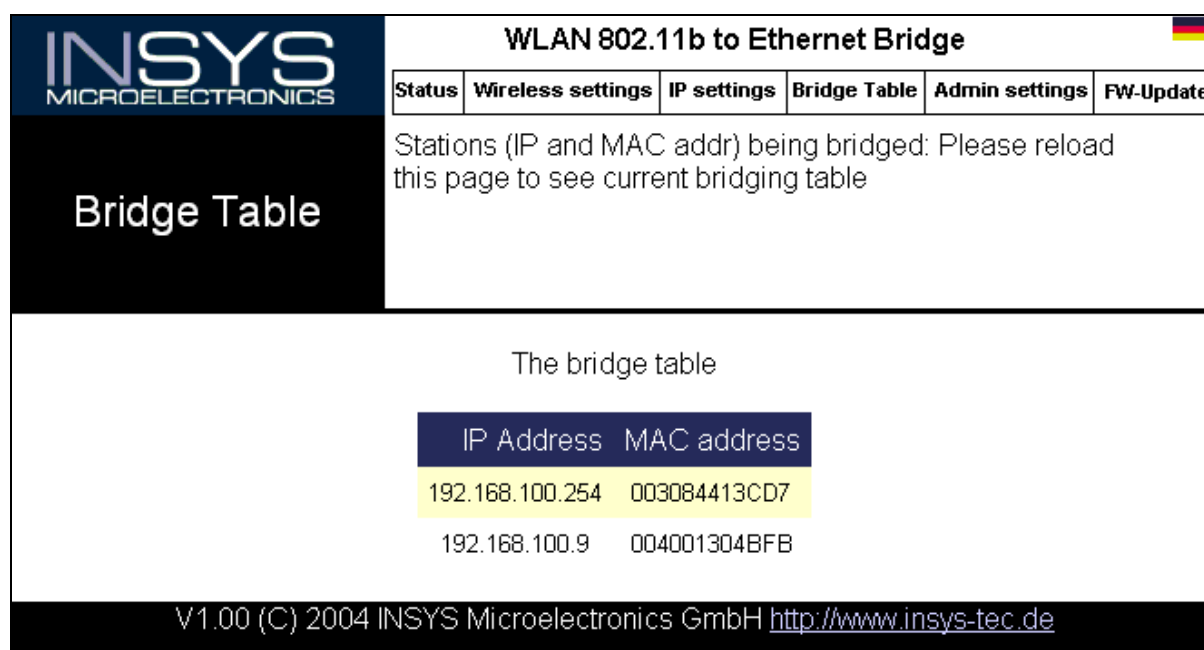
The INSYS WLAN bridge supports two possibilities for IP address allocation: “Static” and “DHCP”.

When the option “Static” (default) is activated, the IP addresses are configured manually. The configuration is done in the displayed window (IP address, subnetwork mask, standard gateway).

When the option “DHCP” (adjustable in the field “IP address mode”) is activated, the das INSYS WLAN bridge attempts to retrieve your IP configuration from a DHCP server at the start. In this case, a DHCP server must be available in the local network, which will allocate an IP address to the INSYS WLAN bridge .

The default settings are IP=192.168.100.203, Subnetwork mask=255.255.255.0, Gateway=192.168.100.1

5.4.6 Bridge Table



INSYS MICROELECTRONICS

WLAN 802.11b to Ethernet Bridge

Status Wireless settings IP settings **Bridge Table** Admin settings FW-Update

Stations (IP and MAC addr) being bridged: Please reload this page to see current bridging table

Bridge Table

The bridge table


IP Address	MAC address
192.168.100.254	003084413CD7
192.168.100.9	004001304BFB

V1.00 (C) 2004 INSYS Microelectronics GmbH <http://www.insys-tec.de>

This page displays all devices which are connected “behind” the INSYS WLAN bridge (IP address and MAC).

The bridging functionality “Layer 2.5 NAT” is described in Chap. 5.4.8.

5.4.7 Administration

INSYS MICROELECTRONICS		WLAN 802.11b to Ethernet Bridge 					
Status	Wireless settings	IP settings	Bridge Table	Admin settings	FW-Update		
Admin settings		<p>This page is used to set up an access password for the configuration pages or to reset the bridge to default settings. Parameter changes will require a reboot..</p>					
User name:		<input type="text"/>					
Administrator password:		<input type="text"/> (Re-enter for confirmation)					
		<input type="button" value="Save"/> <input type="button" value="Cancel"/>					
Commands							
Reboot bridge:		<input type="button" value="Reboot"/>					
Reset to factory defaults:		<input type="button" value="Reset to factory defaults"/>					
V1.00 (C) 2004 INSYS Microelectronics GmbH http://www.insys-tec.de							

On this page, the access protection for the web interface is set with a user name and password. The default settings for user name and password are both empty, i.e. there is no user name and no password.

In addition, this page offers the opportunity, to restart the INSYS WLAN bridge or to restore the factory defaults.

5.4.8 Bridging Function “Layer 2.5 NAT”

The bridging function “Layer 2.5 NAT”, which is built into this INSYS WLAN bridge, enables safe and convenient bridging between two network segments.

The bridging function works transparently for IP connections and requires no special network settings for the individual devices. All devices must simply be located in the same network segment, like for a direct cable connection. A gateway setting is not required either.

The INSYS WLAN bridge itself must be allocated its own IP address from the available local address area. This IP address is basically required for the configuration.

Regarding network technology the bridging function works on MAC level. To reach a device that is connected to a network, an ARP request is sent, which inquires at which MAC address the required device is located. The INSYS WLAN bridge forwards these ARP requests to all connected devices (wireless or not). When the ARP request has arrived on one side of the INSYS WLAN bridge (e.g. on the WLAN side), and a device on the other side of the INSYS WLAN bridge (e.g. LAN interface) replies, the INSYS WLAN bridge sends

its own MAC address as response and saves IP and MAC of the device “behind” it in a table.

With this, the INSYS WLAN bridge virtually passes itself off as the required end device and thus receives all packets which were meant for the end device. These packets are then forwarded to the end device “behind” the INSYS WLAN bridge .

5.5 Firmware Update

The screenshot shows the 'Firmware Update' page of the INSYS WLAN 802.11b to Ethernet Bridge. The page has a dark blue header with the INSYS logo and a navigation bar with tabs: Status, Wireless settings, IP settings, Bridge Table, Admin settings, and FW-Update. The main content area is white and contains the text: 'This page is used to update the internal firmware of the bridge'. Below this, there is a 'File to upload:' label, a text input field, and a 'Durchsuchen...' button. A 'Press' button is also present, followed by the text 'to upload the firmware image!'. A warning message states: 'Warning: Uploading a new firmware can change current settings. You may have to reconfigure the bridge after the update.' At the bottom, it says 'V1.00 (C) 2004 INSYS Microelectronics GmbH' and provides a URL: 'http://www.insys-tec.de'.

This page will enable you to update the firmware of the INSYS WLAN bridge in a simple way.

Click on the button “Browse” to select a firmware update file (in general “update.hex”) from a local directory. Press the button “Here” to load this firmware into the INSYS WLAN bridge.

This process takes approximately 30 seconds. Afterwards the INSYS WLAN bridge is restarted. After a firmware update the device is reset to the default factory settings.

6 Implementation and Configuration INSYS WLAN Serial.

The initial operation may take place comfortably by using the configuration software HSComm under Windows as well as directly by entering the AT commands into a terminal program.

6.1 Configuration Software HSComm

The software HSComm allows the configuration of the INSYS WLAN serial under Windows without explicit knowledge of the AT commands and their parameters. The requested functions and settings can be selected on a graphical user interface. The selected settings are translated to AT commands and sent to or read from the INSYS WLAN serial according to the instruction (button Send).

The configuration software HSComm WLAN is available on the Internet for free download:

<http://www.insys-tec.com/configuration>

6.1.1 General Operation

6.1.1.1 Help

The context sensitive help is available any time via the key **F1** or the menu “Help”. Help also contains the complete command reference for the extended INSYS AT commands.

6.1.1.2 Menus



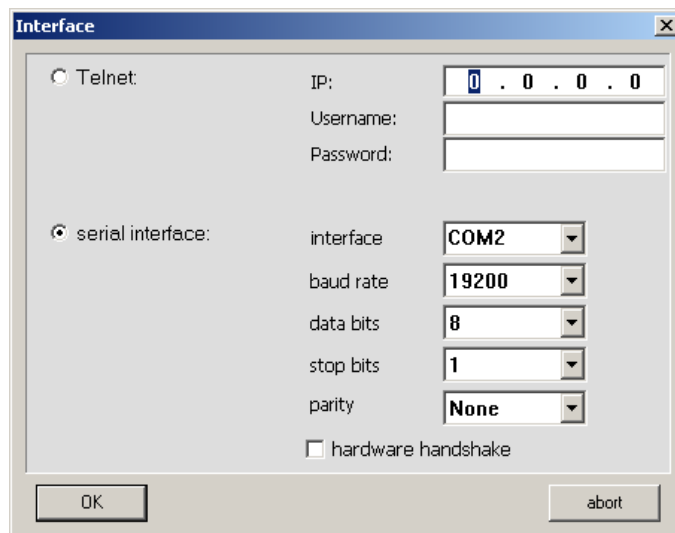
File

The current settings, as displayed in the HSComm user interface, can be saved as a file and read out again.

Interface

Setting of the serial interface which is used at the configuration PC. The baud rate and the format (data bits, stop bit, parity) have to match the settings of the serial interface at the INSYS WLAN serial.

If a remote configuration is performed via WLAN, select Telnet and enter the IP address of the device that is being configured. In addition, the user name and the password which were stored in the INSYS WLAN serial or which were set by the manufacturer must be specified. (see Chap. 6.1.3.3)

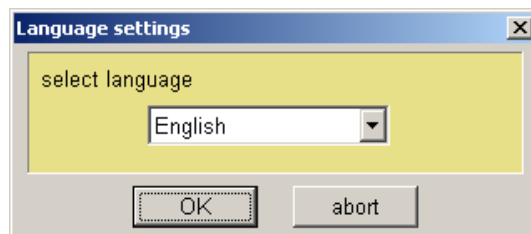


The 'Interface' dialog box has two radio buttons: 'Telnet' and 'serial interface'. The 'serial interface' option is selected. To the right of the radio buttons are fields for 'IP:', 'Username:', and 'Password:'. Below these are fields for 'interface:', 'baud rate:', 'data bits:', 'stop bits:', and 'parity:'. A checkbox for 'hardware handshake' is at the bottom right. 'OK' and 'abort' buttons are at the bottom.

Telnet:	IP:	0 . 0 . 0 . 0
	Username:	
	Password:	
serial interface:	interface:	COM2
	baud rate:	19200
	data bits:	8
	stop bits:	1
	parity:	None
	hardware handshake:	<input type="checkbox"/>

Language

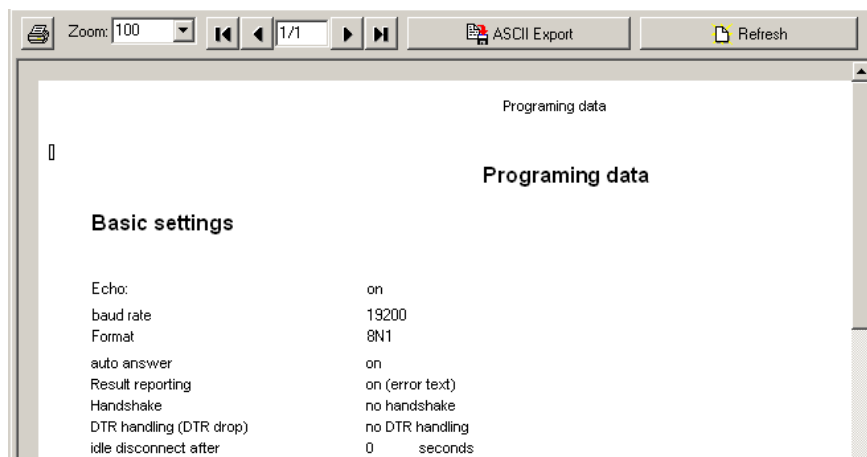
Selection of the HSComm user interface language: German or English. The setting has no effect on the functionality of the INSYS WLAN serial.



The 'Language settings' dialog box has a label 'select language' and a dropdown menu showing 'English'. 'OK' and 'abort' buttons are at the bottom.

Overview

All current settings of the INSYS WLAN serial are clearly displayed. The output extends over several screen pages and can be saved as text file.



The 'Overview' screen shows a list of settings under the heading 'Basic settings'. The settings are displayed in a two-column format. At the top, there is a 'Zoom' dropdown set to '100', navigation buttons, and a '1/1' page indicator. On the right, there are buttons for 'ASCII Export' and 'Refresh'.

Basic settings	
Echo:	on
baud rate	19200
Format	8N1
auto answer	on
Result reporting	on (error text)
Handshake	no handshake
DTR handling (DTR drop)	no DTR handling
idle disconnect after	0 seconds

Note!

Read out the settings of your device and have this overview ready when contacting our hotline!

6.1.1.3 Status Bar



The status bar at the lower window border of the HSComm displays the settings and activities of the serial interface.

6.1.1.4 Buttons

Read

The current settings of the INSYS WLAN serial are read and displayed on the user interface of the HSComm WLAN.

Reset

A device reset is performed in the INSYS WLAN serial.

Default settings

The factory settings (defaults) are loaded.

Attention! The IP address is reset as well. During a remote configuration, this command will abort the connection.

Send

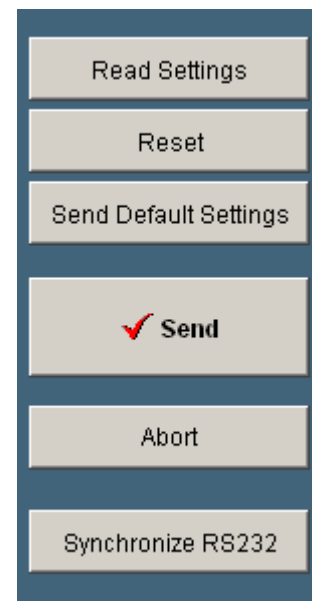
The current settings from the HSComm WLAN user interface are sent to the INSYS WLAN serial.

Abort

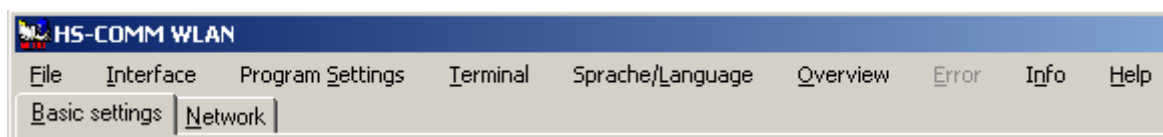
Terminates a running data transmission ("Send", "Read", or "Default settings"). This is indicated by the progress bar above the buttons.

RS232 Synchronize

The serial interface of the INSYS WLAN serial and the used PC must have the same settings. With "Synchronize RS232", all possible baud rate and data format settings at the PC side are tested through until both sides match.



6.1.1.5 Tabs



The settings for the INSYS WLAN serial and the network are spread across two pages, which can be selected via the tab titles. The settings are transmitted to the INSYS WLAN serial only after pressing the button "Send".

The functions are described in detail in the following chapters.

6.1.2 Basic Settings

The screenshot shows the 'HS-COMM WLAN' configuration window. The 'Basic settings' tab is active, displaying several configuration panels:

- Serial Interface:** baud rate (19200), Format (8N1).
- DTR handling (DTR drop):** radio buttons for 'no DTR handling' (selected), 'close connection', and 'reset'.
- Handshake:** radio buttons for 'no handshake' (selected) and 'hardware (RTS/CTS)'.
- Connection:** 'auto answer' is checked; 'idle disconnect after' is set to 0 seconds.
- Result reporting:** radio buttons for 'off', 'on (error text)' (selected), and 'on (error number)'.
- Echo:** checked.
- Digital Outputs:** output 1 and output 2 are both set to 'closed'.
- Digital Inputs:** input 1 and input 2 are both set to 'closed'.

On the right side, there are buttons: 'Read Settings', 'Reset', 'Send Default Settings', 'Send' (with a red checkmark), 'Abort', and 'Synchronize RS232'. The status bar at the bottom shows 'COM2', '19200', '8N1', and 'settings read'.

6.1.2.1 Serial Interface

The settings of the serial interface of the INSYS WLAN serial must match the parameter settings of the device to be connected.

This concerns the transmission rate (baud rate) and the data format (number of data bits, number of stop bits, and parity).

Baud Rate and Data Format

The baud rate and data format settings can be set in the according pull-up menus. The default factory settings are 19200 baud, 8N1.

Echo

With echo, all commands which are transmitted via the serial interface are returned to allow local recording in terminal operation.

This is a close-up of the 'Serial Interface' section from the configuration window. It shows the 'baud rate' set to 19200 and 'Format' set to 8N1. Below this, the 'Handshake' section has 'no handshake' selected. The 'Echo' checkbox is checked.

Handshake

The handshake controls the data flow at the serial interface while the data rate is too high at the moment. Hardware handshake uses the separate control lines RTS/CTS of the serial interface.

Without handshake, overflowing data is ignored.

Attention! Handshake must be deactivated when the INSYS WLAN serial is operated with a device that does not support the according handshake.

DTR Behavior

The control line DTR of the serial interface indicates whether a device (configuration PC, control) is connected with the INSYS WLAN serial and whether it is active. The setting controls the behavior when the DTR signal is missing, e.g. when the terminal device (PC, control) is disconnected.

When the DTR signal is missing, a data connection can automatically be terminated, or a reset can be performed.

Attention! The DTR function must be deactivated (no DTR behavior) when the INSYS WLAN serial is operated with a device that does not support DTR.

The screenshot shows a configuration window with a menu bar at the top containing 'Language', 'Overview', 'Error', 'Info', and 'Help'. The main content area is divided into three sections:

- DTR handling (DTR drop)**: Contains three radio button options: 'no DTR handling' (selected), 'close connection', and 'reset'.
- Connection**: Contains a checked checkbox for 'auto answer' and an unchecked checkbox for 'idle disconnect after' followed by a text input field containing '0' and the label 'seconds'.
- Result reporting**: Contains three radio button options: 'off', 'on (error text)' (selected), and 'on (error number)'.

Connection

In this field, the device can be set to automatically establish the connection.

In addition, the data stream can be monitored via the idle connection control (Data Transmit Control). There is a possibility to terminate the connection when no data was transmitted within a previously set time period. When the time period is zero, or nothing has been entered into the window, the data stream monitoring is not active.

Responses

The response format of the INSYS WLAN serial after an AT command or a system message (**CONNECT**, **NO CARRIER**, **OK**, etc.) can be set as text or numerical code; it can also be switched off, if necessary.

6.1.3 Network

The screenshot shows the 'HS-COMM WLAN' configuration window with the 'Network' tab selected. The window is divided into three main sections: IP Settings, Remote Configuration, and WLAN Settings.

IP Settings:

- IP address: 192 . 168 . 100 . 218
- port: 1234
- net mask: 255 . 255 . 255 . 0
- gateway: 0 . 0 . 0 . 0
- default protocol: ☒ TCP ☐ UDP

Remote Configuration:

- password/user name: [configure button]
- ☐ change password/user name
- ☒ allowed (default port: 23)

WLAN Settings:

- mode: ☐ infrastructure (connection to AccessPoint) ☒ adhoc
- channel: 6
- network name SSID: WLANDEMO
- Security/WEP: ☐ inaktiv ☒ 64 bit WEP ☐ 128 bit WEP
- WEP-Key:

1	11	11	11	00	11	-	-	-	-	-	-
2	00	00	00	00	00	-	-	-	-	-	-
3	00	00	00	00	00	-	-	-	-	-	-
4	00	00	00	00	00	-	-	-	-	-	-
- standard key: 1
- transmission rate: Auto Fallback (default)
- State of connection: [button]

Right Panel:

- Read Settings
- Reset
- Send Default Settings
- Send (with checkmark icon)
- Abort
- Synchronize RS232

Bottom Bar:

COM2 19200 8N1

6.1.3.1 IP Settings

Devices in IP networks use three details to identify connections to other subnetworks. These are details to identify the own device, the own network segment, and the gateway. All IP addresses consist of a sequence of 4 numbers in a range of values from 0 to 255. For private networks without direct Internet connection, numbering areas such as 192.168.*.* are reserved. The IP address describes the network segment as well as the number of the individual device within this segment.

This screenshot shows a zoomed-in view of the 'IP Settings' section from the 'HS-COMM WLAN' configuration window.

IP Settings:

- IP address: 192 . 168 . 100 . 218
- port: 1234
- net mask: 255 . 255 . 255 . 0
- gateway: 0 . 0 . 0 . 0
- default protocol: ☒ TCP ☐ UDP

IP Address

The own address of the INSYS WLAN serial, e.g. 192.168.100.218

Port

The port specifies the applications which will be performed within the internet protocol (IP). The serial interface of the INSYS WLAN serial is represented at the IP address and the port in the WLAN.

Network Mask

Part of the address which describes the network segment.

The subnetwork 255.255.255.0, for example, marks the first three numbers 192.168.100 of the address 192.168.100.218 as network segment.

Gateway

All data packets to recipients outside the own network segment are transmitted to the gateway to be forwarded.

6.1.3.2 WLAN Settings

WLAN Settings

mode: ☐ infrastructure (connection to AccessPoint) ☒ adhoc channel

network name SSID:

Security/WEP: ☒ inaktiv ☐ 64 bit WEP ☐ 128 bit WEP

WEP-Key:

1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-

standard key:

transmission rate:

Input as HEX sequence (0..9, A..F)
 64 bit WEP: 10 hex counts
 128 bit WEP: 26 hex counts

In this field, the parameters for the WLAN interface are set.

Mode

Determination of the WLAN architecture (see Chap. 2.2) “adhoc” (peer-to-peer) or “infrastructure” (AccessPoint).

Channel

Radio channel when using the adhoc mode. In adhoc mode, all involved stations must be set to the same channel. This channel may not be used by other WLAN networks in the reception area at the same time (default “6”). In infrastructure mode the channel is assigned by the AccessPoint.

Network Name SSID

Enter the WLAN network SSID (default "WLANDEMO"). An empty input field indicates a connection with any available network.

Safety/WEP

Activating the buttons "64 bit WEP" or "128 bit WEP" will switch on WEP encryption as well as Shared Key Authentication. The following lengths are allowed: 64 bit and 128 bit.

WEP Key

Up to 4 WEP keys may be stored.

Security/WEP:		<input type="radio"/> inaktiv	<input type="radio"/> 64 bit WEP	<input checked="" type="radio"/> 128 bit WEP										
WEP-Key:	1	11	11	11	11	11	00	00	00	00	00	00	00	00
	2	00	00	00	00	00	00	00	00	00	00	00	00	00
	3	00	00	00	00	00	00	00	00	00	00	00	00	00
	4	00	00	00	00	00	00	00	00	00	00	00	00	00

For 64 bit encryption each WEP key consists of 10 hexadecimal digits; for 128 bit encryption each WEP key consists of 26 hexadecimal digits. The hexadecimal digits (0...9 and A...F) may be used. They must be entered without spaces.

Standard Key

One of the up to 4 defined WEP keys will be set up for the encryption.

Transfer Rate

Adjustment possibilities for fixed data rates or fallback behavior.

Connection Status

State of connection

Clicking on the button "State of connection" will clearly display the current connection data.

Click the button "Connection Status" again to update the values. The optimum received signal level will be in the range -50dBm to -60dBm. Values of -80dBm will be sufficient for a successful connection.

status

status overview

channel:

6

TX transfer rate:

11Mbit/s

radio reception level:

-102dBm

signal to noise ratio:

0dB

Access Point MAC:

02-00-24-72-A6-36

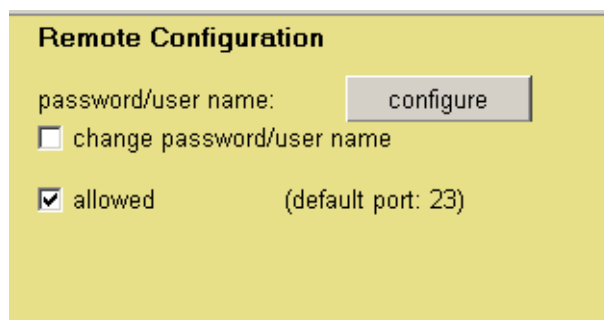
OK

In detail, the following information is provided:

Channel:	Currently used channel
Tx Transfer Rate:	Currently reached data rate
Received Signal Level:	Current quality of the received signal level
Signal-To-Noise Ratio:	Current signal-to-noise ratio:
AccessPoint MAC:	MAC address of the remote terminal (adhoc) or of the AccessPoint

6.1.3.3 Remote Maintenance Using the Configuration Software HSComm

When the WLAN connection for remote configuration of the device is to be used (see interface), the field “Enabled” must be active.

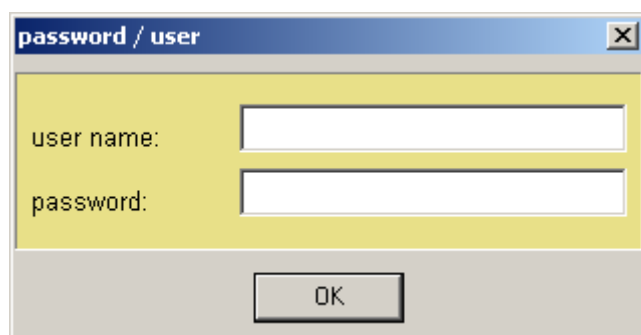


The 'Remote Configuration' dialog box has a yellow background. It contains a label 'password/user name:' followed by a 'configure' button. Below this is a checkbox labeled 'change password/user name'. At the bottom, there is a checked checkbox labeled 'allowed' and the text '(default port: 23)'.

Furthermore, the user name and the password in the INSYS WLAN serial may be changed.

The default factory setting for the user is: insys, and for the password: insys

Clicking the button “configure” will open the field “Password/User”.

The 'password / user' dialog box has a blue title bar with a close button. It has a yellow background. It contains two text input fields: 'user name:' and 'password:'. At the bottom, there is an 'OK' button.

Enter the new user name and the new password.

Attention! When entering the user name and password please consider case sensitivity.

The connection is automatically established when Telnet is selected in the menu “Interface”. The IP address as well as the user name and the correct password of the device to be configured must be entered in advance.

6.2 Configuration Via Terminal Program

The configuration of the INSYS WLAN serial can be performed directly by entering AT commands in a terminal program.

6.2.1 AT Commands for Default Settings

Command	Description
AT&F	Loading the default factory settings
AT&V	Display settings
AT&W	Saving the settings as user defaults
ATZ	Software reset and loading the user defaults

In Chapter 7 you will find a complete description of the AT commands and their parameters.

6.2.2 Serial Interface

Control/PC and the INSYS WLAN serial must be modulated via the following joint settings of the serial interface:

- Baud rate (Data transmission speed)
- Data format (data bits, parity, stop bits)
- Data flow control (hardware handshake)

These settings must also be performed at the device which is connected to the INSYS WLAN serial.

6.2.2.1 AT Commands for the Serial Interface

Command	Description
AT*S	Determine baud rate
AT*U	Determine data format
AT&K	Data flow control between the PC and the modem
ATE	Command echo
AT&S	DSR behavior
AT&C	DCD (CT109) behavior
AT&D	DTR (CT108/2) behavior

In Chapter 7 you will find a complete description of the AT commands and their parameters.

6.2.3 WLAN Network Structure

For a network structure according to IEEE 802.11b, the included devices must be coordinated regarding the following settings:

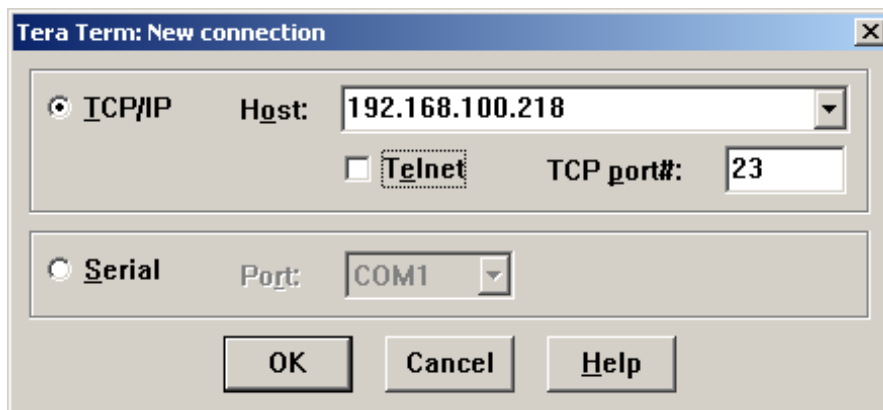
Description	Command
Radio channel (only for adhoc networks)	AT#CHAN
Clear text name of the radio network (SSID)	AT#SSID
Architecture: Infrastructure or adhoc	AT#PTY
WEP Encryption	AT#KEY, AT#WKY, AT#WEL, AT#WKL
Gateway for the local network segment	AT#GW
Network mask for the local network segment	AT#NM
Own IP address	AT#IP
Local port number	AT#PORT

In Chapter 7 you will find a complete description of the AT commands and their parameters.

6.3 Remote Configuration via Telnet

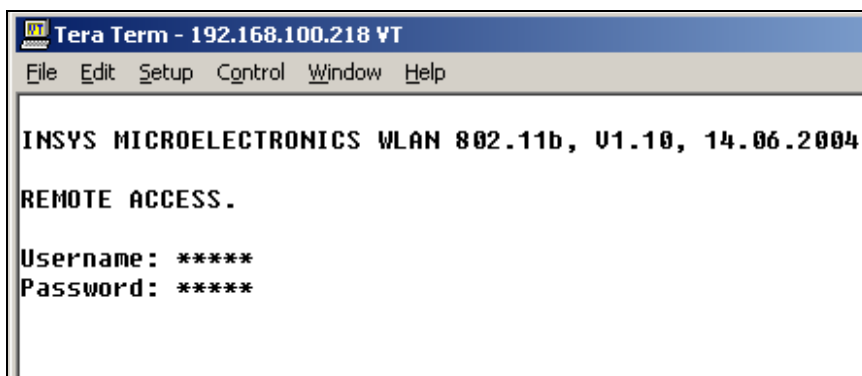
The remote configuration of the INSYS WLAN is possible with a device which is located within the same WLAN network and has network access.

After starting the terminal program the IP address of the INSYS WLAN serial and the TCP port (23) must be entered. Subsequently the connection is established.



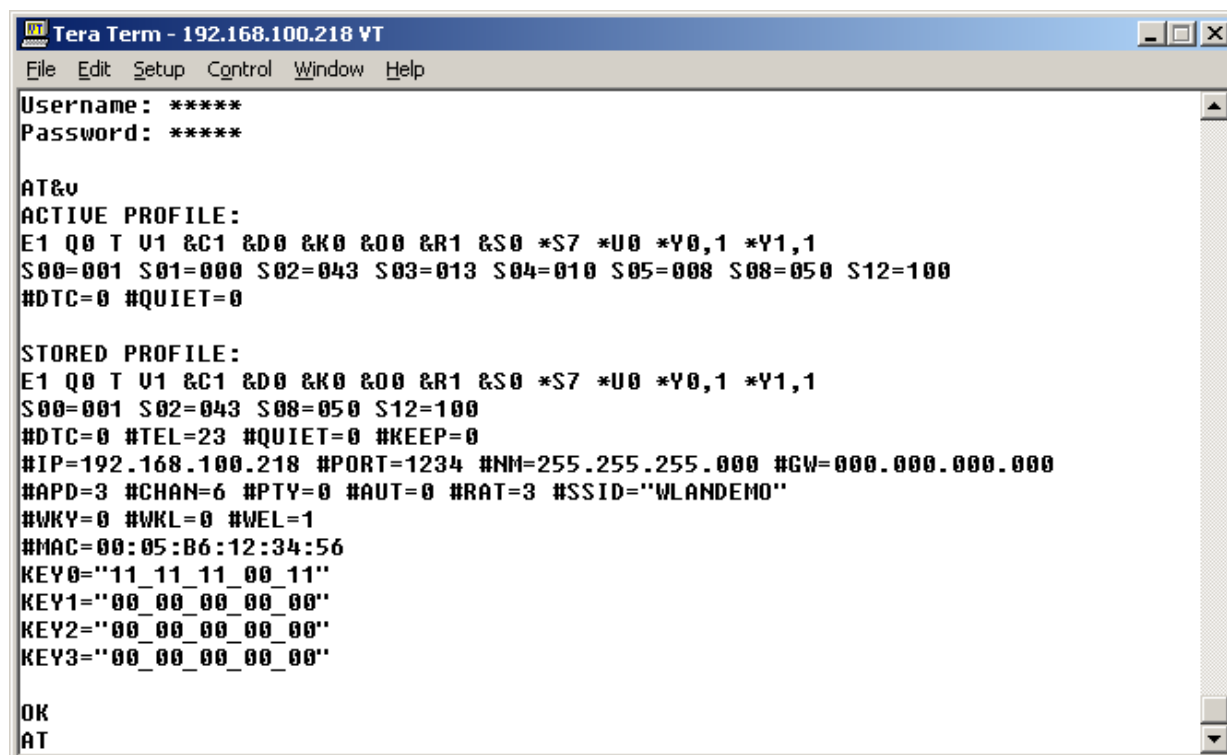
Example: Terminal program TeraTerm Pro.

After the connection has been established successfully, a terminal window is opened and the user is asked to enter the user name and the password. The default factory setting for both entries is: insys



Attention! The user name and the password are case sensitive!

After the user name and the password have been correctly verified, AT commands can be sent to the INSYS WLAN serial via this terminal window. As a result, remote maintenance or remote configuration can be performed.



```

Tera Term - 192.168.100.218 VT
File Edit Setup Control Window Help
Username: *****
Password: *****

AT&v
ACTIVE PROFILE:
E1 Q0 T V1 &C1 &D0 &K0 &O0 &R1 &S0 *S7 *U0 *V0,1 *Y1,1
S00=001 S01=000 S02=043 S03=013 S04=010 S05=008 S08=050 S12=100
#DTC=0 #QUIET=0

STORED PROFILE:
E1 Q0 T V1 &C1 &D0 &K0 &O0 &R1 &S0 *S7 *U0 *V0,1 *Y1,1
S00=001 S02=043 S08=050 S12=100
#DTC=0 #TEL=23 #QUIET=0 #KEEP=0
#IP=192.168.100.218 #PORT=1234 #NM=255.255.255.000 #GW=000.000.000.000
#APD=3 #CHAN=6 #PTY=0 #AUT=0 #RAT=3 #SSID="WLANDEMO"
#WKY=0 #WKL=0 #WEL=1
#MAC=00:05:B6:12:34:56
KEY0="11_11_11_00_11"
KEY1="00_00_00_00_00"
KEY2="00_00_00_00_00"
KEY3="00_00_00_00_00"

OK
AT

```

Example: Query the settings of the INSYS WLAN serial (**AT&V**)

6.4 Firmware Update

Attention! Before the firmware is uploaded, hardware handshake (RTS/CTS) must be activated at the terminal program and the INSYS WLAN serial.

The command **AT**** will start the upload process and the device will prepare itself for receiving the firmware.

After the response **Send file now** the firmware (file with the ending HEX) is sent as a text file.

After the file has been received the device needs up to 60 seconds to complete the upload. The INSYS WLAN serial resets autonomously after the upload.

In Chapter 7 you will find a complete description of the AT commands and their parameters.

7 Command Overview INSYS WLAN serial

7.1 AT commands

7.1.1 Syntax of Standard AT Commands

The AT standard is a line-oriented command language. Each command consists of three elements: Prefix, body and end character.

The prefix always consists of the letters **"AT"**.

The body consists of a name and pertinent values, if applicable. If a pertinent value is optional, this is indicated by square brackets ([...]).

The end character is **<CR>** (=0X0D) by default.

Commands can be grouped to one command line. Space characters between the individual main parts are ignored. The commands can be categorized as follows:

- Basic instruction set
- Extended instruction set (Main part starts with "+" or "^")

The commands are acknowledged with **"OK"** or **"ERROR"**. A command that is being edited will be interrupted by any further incoming character. Therefore, the next command must wait for acknowledgement to avoid the deletion of the current command.

7.1.2 Overview AT Commands

Command	Description
ATA	<u>Manual connection acceptance</u> ATA accepts an incoming connection. ATA only works when the model previously received packets at the local port, i.e. issued the command „RING“ .
AT#APD=	<u>AP Density</u> Setting the search algorithms to AccessPoints – depending on the density of the AccessPoints that is to be expected: AT#APD=1 "Large Density" AT#APD=2 "Medium Density" AT#APD=3 "Small Density" (default) AT#APD=4 "Mini Density" AT#APD=5 "Micro Density" The setting AT#APD is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).

Command	Description
AT#AUT=	<p><u>Set authorization</u></p> <p>Explicit authentication at the AccessPoint before the data exchange</p> <p>AT#AUT=0 Shared Key off (default)</p> <p>AT#AUT=1 Shared Key on</p> <p>The setting AT#AUT is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p>
AT&C	<p><u>DCD behavior</u></p> <p>AT&C0 DCD always on</p> <p>AT&C1 DCD only on with existing connection (default)</p>
AT#CHAN	<p><u>Radio channel for adhoc mode</u></p> <p>In adhoc mode, all involved modules must be set to the same channel.</p> <p>AT#CHAN=n Possible channel settings for Europe: n=1..14</p> <p>In infrastructure mode the channel is assigned by the AccessPoint.</p>
ATD	<p><u>Dial remote terminal</u></p> <p>The remote terminal is specified in the format IP number: Port. If no port is specified, the own port number (set with AT#PORT) is also used for the remote terminal.</p> <p>Optionally, it is possible to specify information regarding the necessary protocol (ATDT for TCP/IP or ATDU for UDP/IP), before the remote terminal is specified.</p> <p>Example:</p> <p>ATDT192.168.100.111:1234 dials port "1234" of the IP address 192.168.100.111 . Protocol: TCP/IP.</p> <p>ATDU192.168.100.111:1234 dials port "1234" of the IP address 192.168.100.111 . Protocol: UDP/IP.</p>
AT&D	<p><u>Behavior with DTR drop</u></p> <p>When the DTR line is deactivated during an existing connection, the function set through AT&D is executed.</p> <p>AT&D0 Ignore DTR drop (for operation at modules which do not serve the DTR line).</p> <p>AT&D2 A DTR drop causes the module to terminate the connection (default).</p> <p>AT&D3 A DTR drop caused the module to terminate the connection and perform a reset.</p>
AT#DTC	<p><u>Idle connection control (Data Transmit Controller)</u></p> <p>The data transmit controller causes an unused connection to terminate automatically. If no data is sent within the preset time, the connection is terminated.</p> <p>AT#DTC=n n in units of seconds</p> <p>The maximum value is a timeout value of 2550 seconds (AT#DTC=255). The data transmit controller can be switched off by setting the time to „0“ (AT#DTC=0). This is also the default setting.</p>
ATE	<p><u>Echo</u></p> <p>ATE0 Switches the echo of the entered command in command mode off</p> <p>ATE1 Switches the echo on (default)</p>

Command	Description
AT&F	<p><u>Load factory settings</u></p> <p>Factory settings (defaults) are loaded.</p> <p>By entering the command sequence AT&F&W, the module can be returned to the factory settings (excluding the network settings).</p> <p>All settings, which can be stored using AT&W, are affected by AT&W (not the network settings, see also AT&W). However, not all settings that were saved using AT&W are changed, only the currently active settings.</p>
AT#GW	<p><u>Set gateway address</u></p> <p>AT#GW sets the address of the standard gateway. This setting is used by remote IP addresses, which can only be accessed by routers, not directly.</p> <p>IP packets, which cannot be sent to the local network (defined by AT#IP and AT#NM), are sent using the address set by AT#GW for forwarding.</p> <p>AT#GW is used in connection with AT#NM to establish a connection via a router. If a router is used, AT#GW and AT#NM must be set to enable a data connection via the router.</p> <p>The default setting is AT#GW=192.168.1.1</p> <p>The setting AT#GW is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p> <p>The IP address, the gateway and the network mask must be coordinated in the local network segment.</p> <p>.</p>
ATH	<p><u>Dummy command</u></p> <p>Command with an optional parameter without effect implemented for compatibility to the modem – response “OK”.</p> <p>The device does not support any online command mode.</p>
ATI	<p><u>Display of the module identification</u></p> <p>ATI0 displays the device type („WLAN 802.11b“)</p> <p>ATI3 displays the version number and the date when the software was created</p> <p>ATI4 displays an ID string and the version number</p>
AT*I	<p><u>Querying the Alarm Input</u></p> <p>Response: <Input1>, <Input2></p> <p>0 Input is connected to GND and therefore activated</p> <p>1 Input is open and therefore not activated</p>
AT#IP	<p><u>Set own IP address</u></p> <p>AT#IP sets the own IP address of the device, e.g.</p> <p>AT#IP=192.168.1.1</p> <p>The default setting is AT#IP=192.168.1.160.</p> <p>The setting AT#IP is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p> <p>IP address, gateway and network mask must be coordinated in the local network segment.</p>

Command	Description
AT&K	<p><u>Data flow control</u></p> <p>AT&K sets the function of the data flow control. AT&K0 switches the data flow control off (default). AT&K3 switches the hardware data flow control (RTS/CTS) on AT&K8 Activates the controlled half duplex operation on the serial interface for RS485 In this mode, the CTS signal is deactivated (high), while the device sends data at the serial interface. Thus, the CTS signal can be used as driver release signal for a RS485 driver. Controlling of the data direction for RS485 takes place via the CTS signal. Polarity setting via AT&R.</p>
AT#KEEP	<p><u>TCP/IP Keep Alive</u></p> <p>This timer enables the monitoring of an existing TCP/IP connection when no data is transferred. When 3 consecutive monitoring packets are not answered, the connection is terminated and re-established, if necessary (in leased line mode, see AT&L).</p> <p>AT#KEEP=n n=1..255 The time between monitoring packets in units of 10 seconds n=0 No monitoring packets (default)</p> <p>The setting AT#KEEP is immediately stored in the permanent memory (independent from the command AT&W).</p>
AT#KEYn=	<p><u>Define WEP keys</u></p> <p>Entering of the WEP keys 0..3 as a series of hexadecimal digits (0..9,A..F) in quotes. After every two digits an underscore follows as separator. For 64 bit keys 10 hexadecimal digits are required; for 128 bit keys 26 hexadecimal digits. Default setting: empty keys (all 0)</p> <p>AT#KEY0="11_12_13_14_15_16_17_18_19_1a_1b_1c_1d" AT#KEY1="11_12_13_14_15_16_17_18_19_1a_1b_1c_1d" AT#KEY2="11_12_13_14_15_16_17_18_19_1a_1b_1c_1d" AT#KEY3="11_12_13_14_15_16_17_18_19_1a_1b_1c_1d"</p> <p>A single WLAN is determined by joint codes (SSID) and WEP keys. WEP encryption is switched on via AT#WEL. The key length is determined via AT#WKL. The active WEP key is selected with AT#WKY. The setting AT#KEYn is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p>
AT#NM	<p><u>Set network mask</u></p> <p>AT#NM sets the address range of the local network in connection with AT#IP. All packets that are not sent to the local network, are sent to the gateway address set by AT#GW. The default setting is AT#NM=255.255.255.0 The setting AT#NM is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT). IP address, gateway and network mask must be coordinated in the local network segment.</p>
AT&O	<p><u>Set the function of the OH line</u></p> <p>AT&O0 OH is active (low) as soon as a physically functioning WLAN link is available, i.e. the module is registered at the AccessPoint. (Link ok, default) AT&O1 OH is active (low), as soon as a connection (TCP/IP or UDP/IP) is active</p>

Command	Description
AT#PING	<p><u>Send PING</u></p> <p>AT#PINGa.b.c.d sends an echo request (PING) to a remote terminal (similar to the standard TCP/IP program). If an echo is received within a timeout period of 2 seconds, the required time is displayed.</p> <p>AT#PING is used to check if an IP number can be reached. If AT#PING fails, no connection can be established to the specified IP number.</p> <p>The reason could be a wrong configuration or a firewall between the two network subscribers.</p>
AT#PORT=	<p><u>Set local port number</u></p> <p>AT#PORT=n sets the local port number to the value n (1..65535).</p> <p>For automatic call acceptance, the local port number is used as the port number to which the module "listens".</p> <p>The default setting is AT#PORT=1234</p> <p>The setting AT#PORT is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p>
AT#PTY=	<p><u>Set port type</u></p> <p>Determination of the WLAN architecture</p> <p>AT#PTY= 0 Adhoc (peer-to-peer)</p> <p>AT#PTY= 1 Infrastructure (Connection to AccessPoint – default)</p> <p>The setting AT#PTY is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p>
ATQ	<p><u>Quiet control</u></p> <p>This command switches the sending of messages from the device via the serial interface on or off.</p> <p>ATQ0 Send messages to PC (default)</p> <p>ATQ1 Don't send messages to PC</p>
AT#QUIET	<p><u>Suppress switch-on message</u></p> <p>AT#QUIET=0 shows the switch-on message during the cold start (default)</p> <p>AT#QUIET=1 suppresses the switch-on message of the device</p> <p>The setting of AT#QUIET is stored with AT&W in the fail-safe module memory of the device.</p>
AT&R	<p>Polarity of the CTS control line</p> <p>for controlling a RS485 driver (see also AT&K8). The CTS signal is set to active or inactive when the device receives data at the serial interface:</p> <p>AT&R0 CTS signal inactive</p> <p>AT&R1 CTS signal active (default)</p>

Command	Description
AT#RAT=	<p>Set data rate (in Mbps)</p> <p> AT#RAT=1 "Fixed 1 Mbps" AT#RAT=2 "Fixed 2 Mbps" AT#RAT=3 "Auto Fallback" (default) AT#RAT=4 "Fixed medium rate" AT#RAT=5 "Fixed high rate" AT#RAT=6 "Auto fallback standard" AT#RAT=7 "Auto fallback medium" </p> <p>The setting AT#RAT is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p>
AT#RBT AT#RESET	<p>Reboot</p> <p>The device is rebooted. All network parameters are reloaded from the permanent memory.</p>
ATS0=	<p>Number of ringing tones until automatically going off-hook.</p> <p> ATS0=n determines the number of ringing tones (received packets), after which it automatically goes off-hook. ATS0=1 goes off-hook when the local port is first accessed (default) ATS0=0 deactivates automatically going off-hook when the local port is accessed. </p> <p>For UDP/IP connections, ringing tones represent single (also empty) UDP/IP network packets. For TCP/IP connections, connection requests of a remote terminal („SYN“) are recognized as ringing tones.</p> <p>While the UDP connection is established, the modules send an empty UDP data packet in the beginning, so the remote terminal device accepts the connection if it is configured with ATS0=1.</p> <p>Important difference to modems: In TCP/IP mode, for S0=0 the connection acceptance is completely blocked, i.e. „RING“ is not displayed for a connection request.</p> <p>For manual connection acceptance, S0=200 should be set.</p>
ATS1?	<p>Number of received packets for connection request</p> <p>Query of the number of TCP-SYN packets. This registry is used to achieve a behavior such as, for example, S0=2.</p>
ATS2=	<p>Character for escape sequence</p> <p>The escape sequence consist of a series of a 1 second pause, 3 times the escape character and 1 second pause again. (The pre and post run time of 1 second can be changed using ATS12)</p> <p> ATS2=n n=0...127 Determination of the escape character as ASCII code n=43 Default setting „+“ n>127 Functionality deactivated </p> <p>The setting is stored in the permanent memory with AT&W.</p>
ATS3=	<p>Carriage Return – CR</p> <p> ATS3=n n=0...127 Determination of the character as ASCII code n=13 Default setting </p> <p>The setting is <i>not</i> stored with AT&W in the permanent memory.</p>

Command	Description
ATS4=	<u>Character for line feed – LF</u> ATS4=n n=0...127 Determination of the character as ASCII code n=10 Default setting The setting is <i>not</i> stored with AT&W in the permanent memory.
ATS5=	<u>Character for backspace – BS</u> ATS5=n n=0...127 Determination of the character as ASCII code n=8 Default setting The setting is <i>not</i> stored with AT&W in the permanent memory.
ATS8=	<u>Set waiting period for block formation</u> Sets the waiting time until a block is sent via the network. The unit is in 1/1000 seconds (1 ms). The time starts to run as soon as a character is received. As soon as no data is received from the serial interface during the period set in S8, a data packet is sent. Small values in S8 lead to faster transmission of short messages, but increase the number of packets and therefore the load on the network side. Large packets in S8 lead to a delay of small data packets. ATS8=n n=2..255 Waiting period in milliseconds (corresponds to 2ms ... 255 ms) n=50 50 ms (default) The setting is stored in the permanent memory with AT&W .
ATS12=	<u>Pre and post run time for escape sequence</u> Minimum pre and post run time when sending the escape sequence („+++“) ATS12=n n=2...255 Time in units of 1/10 seconds n=10 Default setting 1 second The setting is stored in the permanent memory with AT&W.
ATSn?	<u>Query S-registry</u> n = 2,3,4,5,8,12 Query of the according registry Access to other S-registries will not lead to errors, but also has no effect. When reading non-implemented S-registries the value „0“ is returned.
AT*S	<u>Set baud rate</u> AT*S sets the baud rate at the serial interface. The following baud rates are supported: AT*S1 300 baud AT*S2 600 baud AT*S3 1,200 baud AT*S4 2,400 baud AT*S5 4.800 baud AT*S6 9,600 baud AT*S7 19,200 baud (default) AT*S8 38,400 baud AT*S9 57,600 baud AT*S10 115,200 baud
AT&S	<u>DSR behavior</u> AT&S0 DSR is always active (default) AT&S1 DSR follows DCD, e.g. DSR is only active for existing connections

Command	Description
AT#SSID=	<u>Define SSID</u> AT#SSID="WLAN_DEMO" The setting AT#SSID is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).
AT#STAT	<u>Display status</u> AT#STAT displays the current status of the WLAN connection: <ul style="list-style-type: none"> • Used channel • Data rate of the connection • Signal-to-noise ratio SNR and incoming power Rx LEVEL – Select location and positioning of the antenna in a way that $SNR \geq 20$ dB. • The MAC of the AccessPoints, with which a connection has been established
AT#TEL	<u>Telnet port for remote configuration</u> AT#TEL=n n : Determines the remote configuration port via Telnet for the TCP/IP port n=0 Deactivates the access n=23 Default setting for Telnet During remote configuration all AT commands can be entered, so a remote firmware update (AT**) or establishing a connection is also possible remotely. The user name and password are determined via AT#TLU and AT#TLP . The setting AT#TEL is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).
AT#TLP	<u>Password for remote configuration</u> AT#TLP="password" Password for remote configuration (in quotes) – Maximum of 8 characters. The entry is case sensitive. Default is „insys“ The user name and the Telnet port are determined with AT#TLU and AT#TEL . The setting AT#TEL is immediately stored in the permanent memory (independent from the command AT&W).
AT#TLU	<u>User name for remote configuration</u> AT#TLU="name" User name for remote configuration (in quotes) – Maximum of 8 characters. The entry is case sensitive. Default is „insys“ The password and the Telnet port are determined with AT#TLP and AT#TEL . The setting AT#TEL is immediately stored in the permanent memory (independent from the command AT&W).
ATT	<u>Select TCP mode</u> For the next connection ATT selects the TCP mode. This setting applies to ATD commands without a specific protocol (e.g. ATD192.168.100.200:1234 or for incoming calls.

Command	Description
ATU	<u>Select UDP mode</u> For the next connection ATU selects the UDP mode. This setting applies to ATD commands without a specific protocol (e.g. ATD192.168.100.200:1234 or for incoming calls.
AT*U	<u>Select data format</u> AT*U sets the data format at the serial interface. The following data formats (data bits, parity, stop bits) are supported: AT*U0 8N1 (default) AT*U1 7E1 AT*U2 7O1 AT*U4 7E2 AT*U5 7O2 AT*U6 7N2 AT*U7 8E1 AT*U8 8O1 AT*U9 8N2
ATV	<u>Select message format (short or long format)</u> ATV sets the format for responses. When ATV1 (default) is set, the messages are displayed in clear texts; for ATV0 the message numbers are displayed (see table of message numbers below)
AT&V	<u>Display settings and connection statistics</u> AT&V0 displays the current and saved settings of the module. AT&V1 Displays the diagnostic data of the last connection (connection partner, reason for disconnect).
AT&W	<u>Save settings</u> AT&W saves all current settings in the permanent memory. The settings are restored from this permanent memory, when the module is switched on. The following AT settings are stored: AT&C, AT&D, ATE, AT&K, AT&O, AT#QUIET, ATS0, ATS8, AT*S, AT&S, AT*U, ATT, ATU, ATV.
AT#WEL=	<u>Switch WEP on and off</u> AT#WEL=0 off (default) AT#WEL=1 on The setting AT#WKY is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).
AT#WKL=	<u>Length of the WEP key</u> AT#WKL=0 64 bit AT#WKL=1 128 bit (default) The setting AT#WKY is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).

Command	Description
AT#WKY=	<p><u>Define TX WEP key</u></p> <p>Selection of the currently used WEP key that was defined with AT#KEY.</p> <p>AT#WKY=0 (default) AT#WKY=1 AT#WKY=2 AT#WKY=3</p> <p>The setting AT#WKY is immediately stored in the permanent memory (independent from the command AT&W). The setting will only take effect with Reboot (AT#RBT).</p>
ATX	<p><u>Dummy command</u></p> <p>Command with an optional parameter without effect implemented for compatibility to the modem – response “OK”.</p> <p>The device does not support any online command mode.</p>
AT*Yx,y	<p><u>Switch outputs</u></p> <p>x: Port 0 Port UA1 1 Port UA2</p> <p>y: Desired condition of the UAx output 0 Pin UAx low 1 Pin UAx high</p> <p>Notes: If no port is specified (x), UA1 is used Default: AT*Y0,0 AT*Y1,0</p>
ATZ	<u>Dummy instruction (no function).</u>
AT**	<p><u>Firmware Update</u></p> <p>AT** starts the update process for the firmware (flash update).</p> <p>IMPORTANT: To update the firmware, hardware handshake (RTS/CTS) must be activated at the terminal</p> <p>After AT** is entered, the device prepares itself for receiving the firmware.</p> <p>After the response Send file now the firmware (file with the ending HEX) must be sent as a text file.</p> <p>After the file has been sent, the firmware update needs some (up to 60) seconds time during which the update is carried out.</p> <p>After the flash update, the device resets autonomously.</p> <p>Routine:</p> <p>Entry: AT**</p> <p>Response: Wait. Preparing firmware upgrade. Send file now. Enable RTS/CTS.</p> <p>Wait 10 seconds and then send the firmware file as text (not binary). (TeraTerm: Menu File → Send file...)</p> <p>Response: Firmware upload finished. Firmware successful validated. Wait. Processing firmware update and reboot.</p> <p>Afterwards, the INSYS WLAN serial resets and displays the start up message.</p>

Command	Description
+++	<u>Escape sequence</u> If the sequence “+++” is sent during an active connections with at least 1 second pause before and after the sequence, the module will terminate the connection. Unlike the modem, no online command mode is supported.

7.2 Responses and Numerical Codes

The following message texts (with setting **ATV1**) or message numbers (with setting **ATV0**) are displayed by the module:

Message number Short form (ATV0)	Message text Long form (ATV1)	Meaning
0	OK	Command was accepted
1	CONNECT	Connection was established
2	RING	Connection request was recognized
3	NO CARRIER	Connection was terminated
4	ERROR	Error in AT command string
7	BUSY	Remote terminal did not accept connection